THE GENUS *STRYCHNOS* IN COLOMBIA

B. A. Krukoff and J. Monachino
The New York Botanical Garden, New York.

Although the genus *Strychnos* is very well represented in Colombia, especially on the eastern lowlands drained by the tributaries of the Amazon, until recently, exceedingly few specimens of this genus from Colombia were available in the major herbaria of Europe and of the U. S. A. There appears to be no published record of the species that occur in Colombia.

In the present paper we have enumerated the species that occur in Colombia and have compiled a key to these species. Of the ten species collected up to the present date in Colombia, six are of recent collections by Dr. J. Cuatrecasas. We have also included in this paper fifteen species of *Strychnos* that have not been collected in Colombia as yet and which, however, in our opinion doubtless occur there. A great majority of these species were collected by the senior author in a single locality in the basin of Igarapé Belem, a northern tributary of the upper Solimões, in municipality São Paulo de Olivença, in the State of Amazonas, Brazil—only 20 kilometers from the Colombian border. The upper part of Igarapé Belem is in Colombian territory north of Leticia, and the climatological and soil conditions, as well as the types of forest there, are essentially similar to those of adjacent Brazil.

We have tried in this paper to arrange the species according to their taxonomic relationship. Neither descriptions of the species, nor of the genus or its three sections as we recognize them for the Western Hemisphere, are given here, as these may be found in our previous papers on *Strychnos* (4, 5, 6). In the present paper we limit our citations to specimens collected in Colombia. To stimulate interest in further collection of *Strychnos* in Colombia, we have included notes under the species concerning their usage as either a main or a secondary ingredient of Curare in various countries of South America. It should be noted that up to the present time very little, if anything, has been published concerning the botanical components of Curare as they are used by the Indians in Colombia.

The place of deposit of specimens examined is shown throughout this paper by the following abbreviations:

NY: New York Botanical Garden.

US: U. S. National Herbarium, Smithsonian Institution, Washington.

COL: Herbario Nacional Colombiano (Instituto de Ciencias Naturales) Bogotá, Colombia.

KEY TO THE SECTIONS

Corolla-tube manifestly longer than calyx and about equal to or much longer than corolla-lobes; style more than thrice length of ovary; anthers glabrous or (if pilose) long and acuminate at base; if inflorescences terminal then corolla-lobes when bearded not so along an upwardly curved arc.

Corolla-tube longer than corolla-lobes; filaments none or (if distinct) with anthers less than 1 mm. long (acuminate at base if longer); if inflorescences axillary then leaf-blades in age frequently drying an ocher-yellow .... I. **Longiflorae**.

Corolla-tube about as long as corolla-lobes; filaments and anthers more than 1 mm. long and anthers rounded at base; inflorescences axillary and leaf-blades not drying yellow .... II. **Intermediae**.

Corolla-tube about equal to or shorter than calyx and manifestly shorter than corolla-lobes (except *S. pachycarpa*); styles less than thrice length of ovary; anthers rounded at base and usually more or less pilose; inflorescences terminal and the corolla-lobes within bearded along an upwardly curved arc (except *S. parviflora* which is unique in having sharply conical stigma) .... III. **Breviflorae**.

KEY TO THE SPECIES OF LONGIFLORAE

Flowers not known; leaf-blades with principal nerves deeply impressed above, the secondaries and tertiaries likewise impressed and forming a loose reticulation.

Leaf-blades 13-19 cm. long, densely subhirtellous beneath with brown-rusty hairs; branchlets and petioles dark-brown ferrugineous-sub-hirtellous. 7. *S. javariensis*.

Leaf-blades 8-14 cm. long, macroscopically glabrous (universally microscopically puberulent beneath with very short, mostly adpressed hairs); branchlets and petioles not dark-brown ferrugineous ...... 8. *S. solimoesana*.

Flowers known; combination of characters not as in the above two species.

Infl. terminal; leaf-blades usually not drying yellowish.

Filaments not distinct; tube of corolla glabrous at throat within.

Corolla-tube glabrous and papillose without; anthers less than 1 mm. long; calyx-lobes about 1 mm. long. glabrous without .... 2. *S. Barnhartiana.*

Corolla-tube conspicuously strigose without; anthers over 1 mm. long; calyx-lobes about 2 mm. long, pubescent without. 6. *S. diaboli.*

Filaments distinct.

Tube of corolla pilose at throat within, glabrous without; corolla-lobes well pilose on the whole face within as well as densely bearded at base; infl. densely fulvous-puberulent with adpressed hairs; filaments very short but distinct; calyx-lobes deltoid-ovate to ovate-lanceolate; leaf-blades often drying yellowish. 1. *S. rondeletioides.*

Tube of corolla glabrous at throat within; corolla-lobes not pilose on the whole face within.

Filaments about as long as anthers (? S. hachensis).

Corolla-tube conspicuously pubescent without, the lobes pubescent within; infl. and calyx hirsute with hairs about 1 mm. or more long; leaves hirsute. ..... 5. *S. toxifera.*

Corolla-tube glabrous without, the lobes glabrous within; infl. and calyx not hirsute; leaves subglabrous or strigose. 3. *S. hachensis.*

Filaments much longer (twice or more) than anthers, these greatly exserted; corolla-lobes glabrous within; calyx-lobes glabrous without; infl. subsetulose in streaks or glabrous. 4. *S. panamensis.*

Infl. axillary; leaf-blades usually drying yellowish in age; anthers sessiloid (short filaments present in *S. Erichsonii*); calyx-lobes ovate to ovate-lanceolate; pedicels equal to or shorter than calyx-lobes.

Anthers about 1.75 mm. long and acuminate at base, pilose; corolla-tube glabrous within and without, not papillose, the lobes sparsely pubescent near the sinuses within; style pilose. ...... 9. *S. Jobertiana.*

Anthers short (up to 1 mm. in *S. Peckii* and rounded at base, glabrous; corolla-tube pilose within, papillose, the lobes moderately to densely bearded within.

Styles pilose. .... 10. *S. amazonica.*

Styles glabrous.

Lobes of corolla pubescent within above the bearded base; corolla-tube pilose at throat within; calyx-lobes pubescent without; infl. densely puberulent.

Corolla-tube pubescent without; calyx-lobes broadly ovate-deltoid, about 1 mm. long, glabrous within. 11. *S. Peckii.*

Corolla-tube glabrous without; calyx-lobes ovate-lanceolate, up to 2 mm. long, well puberulent within. 12. *S. Smithiana.*

Lobes of corolla essentially glabrous within above the bearded base.

Anthers on short but distinct filaments; calyx-lobes broadly deltoid, puberulent within; corolla-tube pilose at throat within; leaf-blades not barbate beneath. 13. *S. Erichsonii.*

Anthers sessiloid; calyx-lobes ovate to ovate-lanceolate, glabrous within.

Infl. glabrescent to rather sparsely pubescent; calyx-lobes about 1 mm. long, acute or obtuse at apex, glabrous or sparsely puberulent without; leaf-blades shining beneath. 14. *S. Mitscherlichii.*

Infl. densely puberulent to subsetulose; calyx-lobes about 1.5 mm. long. acuminate at apex, well subsetulose-pubescent without; leaf-blades pale beneath. .... 15. *S. darienensis.*

KEY TO THE SPECIES OF INTERMEDIAE

Style glabrous; infl. loosely flowered, pedicels usually obvious.

Plants macroscopically pubescent; leaf blades 1.5-9 cm. long and 1.5-5 cm. broad, principal nerves not impressed, reticulation usually faint or obscure; infl. racemose and short, few (5-7) flowered. ...... 16. *S. guianensis.*

Plant macroscopically glabrous; leaf-blades 5-20 cm. long and 4-7.5 cm. broad, the inner pair of principal nerves deeply impressed above, reticulation finely and closely intricate and raised on both surfaces; infl. generally compound and elongated, many-flowered; calyx-lobes about 1 mm. long. .... 17. *S. panurensis.*

Style pilose at base; infl. compactly flowered, pedicels short or none; leaf-blades 6-20 cm. long and 3-10 cm. broad; calyx-lobes up to 2 mm. long. 18. *S. cogens.*

KEY TO THE SPECIES OF BREVIFLORAE

Infl. axillary; corolla-lobes pubescent on the whole face within; stigma sharply conical; leaf-blades 8-18 cm. long, pale-glaucescent beneath. 19. *S. parviflora.*

Infl. terminal; corolla-lobes bearded along a line within; stigma capitate; leaf-blades with no striking pallor beneath.

Leaf-bades 15-30 cm. long and 7-21 cm. broad, beneath densely fulvous-subhirtellous or velutinous, above impressed loose-reticulate and bullate; peduncles about 2.5 mm. in diam. .... 20. *S. Castelnaeana.*

Leaf-blades less than 15 cm. long, not impressed-reticulate or bullate above; peduncles less than 2 mm. in diam.

Pedicels short but distinct; infl. not congested. (Species difficult to separate by key-characters).

Petioles 1-3 mm. long; blades 1-8 cm. long; branches usually not conspicuously dot-lenticellate and spines straight or slightly curved. 25. *S. tarapotensis.*

Petioles 2-7 mm. long; blades 2.5-14 cm. long; branches usually conspicuously dot-lenticellate, spines few and usually curved.

Infl. glabrous to very sparsely puberulent. .... 21. *S. brachistantha.*

Infl. sparsely to somewhat puberulent; leaf-blades beneath often barbate or with membranaceous pockets in axils of primary nerves. .... 22. *S. nigricans.*

Pedicels none or very short; infl. congested and in spherical clusters; calyx-lobes lanceolata or linear-lanceolate, recurved at apex.

Peduncles long (about 20 mm.); calyx-lobes lanceolate, about 2 (-2.5) mm. long, not blackening upon drying. ...... 23. *S. Poeppigii.*

Peduncles none or very short (shorter than flower-cluster); calyx-lobes linear-lanceolate, 2-4 mm. long, blackening upon drying. 24. *S. longisepala.*

1. **Strychnos rondeletioides** Spruce; Benth. Jour. Linn. Soc. 1:104. 1856. Colombia: Vaupés: basin of Río Vaupés, *Pérez-Arbeláez & Cuatrecasas 6744* (US, COL); *Cuatrecasas 6904* (US, COL).

2. **Strychnos Barnhartiana** Krukoff, Brittonia 4:268. 1942.

The species doubtless occurs in Amazonian Colombia, Several collections were obtained by the senior author in Brazil in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

3. **Strychnos hachensis** Karst. Fl. Columb. 2:75. 1863.

This species is known only from the type collection, obtained at the altitude of 100 meters near Tomarrazón, Magdalena, Colombia by Karsten. Its rediscovery in the type locality would be of very considerable scientific interest.

4. **Strychnos panamensis** Seem. Bot. Voy. Herald 166. 1854.

Colombia: *Mutis 1354* (US); Chocó: basin of the Atrato river, Truandó, *A. C. V. Schott s. n.* (Dec. 1857) (NY).

This plant is cited as "Cinchonaceae No. 1" in J. Torrey's manuscript copy of Schott's Atrato Plants. "Cinchonaceae No. 2", collected in the same region and also available to us, has been determined as

Malouetia guatemalensis (Muell. Arg.) Standley. The Torrey's manuscript it deposited with the library of the New York Botanical Garden.

5. **Strychnos toxifera** Rob. Schomb.; Benth. Jour. Bot. Hook. 3:240. 1841.

This species has been collected in Amazonian Brazil and Ecuador, and it doubtless occurs also in Amazonian Colombia. *Krukoff 8934* and *8935* were collected in Brazil in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

This species is well known as the main ingredient of the Curare of the Macusi and Wapisiana Indians of British Guiana, as was first ascertained by Robert Schomburgk in 1835 (on the basis of the type collection) and verified by Richard Schomburgk in 1842, and thence reported by many others. Spruce collected a specimen of it in the Cassiquiare region of Venezuela and reported on the label: "one of the species used by the Cunipusana Indians in the fabrication of Curare". Occasionally it is used for this purpose as a secondary ingredient by the Tecunas of Brazil (7, p. 406). According to Gill the bark of its stems is frequently used as an ingredient in the Curare by the Canelos in Ecuador (8, p. 310).

6. **Strychnos diaboli** Sandw. Kew Bull. 1931: 486. 1931.

The species doubtless occurs in Amazonian Colombia. *Krukoff 9071, 9073* and *9081* were collected in Brazil in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

7. **Strychnos javariensis** Krukoff. Brittonia 4:279. 1942.

This species doubtless occurs in Amazonian Colombia. It has been collected by the senior author in Brazil in the basins of rivers Javary and Solimoes, not far from the Colombian border.

The bark of this species is occasionally used as a secondary ingredient in the Curare by the Javas in Perú and Brazil (7, p. 409).

8. **Strychnos solimoesana** Krukoff, Brittonia 4:280. 1942.

The species doubtless occurs in Amazonian Colombia. The type collection (*Krukoff 9066*) was obtained in Brazil, in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

According to Dr. Ducke (2, p. 9) the species is used in the basin of Rio Tonantins in Brazil as a principal ingredient of the Curare by the Cauichana Indians.

9. **Strychnos Jobertiana** Baillon, Adansonia 12:367. 1879.

The species has been collected in Amazonian Brazil, Ecuador and Perú and it doubtless occurs also in Amazonian Colombia. Several collections were obtained by the senior author in Brazil in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

On the basis of the type collection, Jobert reports this as one of the two species of *Strychnos* used by the Cauichanas (Rio Tonantins) in Brazil in preparing Curare, the other being *S. subcordata* (1, p. 367). It is also used as a secondary ingredient by the Javas in Brazil and Perú (7, p. 409); and according to Gill, for the same purpose by the Canelos in Ecuador (8, pp. 312-313). The Canelos Indians are said to use not only the park of the stem but also that of the roots in their Curare.

10. **Strychnos amazonica** Krukoff, Brittonia 4:284. 1942.

The species has been collected in Amazonian Brazil and Perú, and it doubtless occurs also in Amazonian Colombia. *Krukoff 9061* and *9069* were collected in Brazil in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

11. **Strychnos Peckii** B. L. Robinson, Proc. Am. Acad. 49:504. 1913.

Colombia: Valle del Cauca: Río Cajambre, *Cuatrecasas 17447* (NY).

The bark of this species is occasionally used as a secondary ingredient in the Curare by the Tecunas of Brazil (7, p. 406). According to Gill it is also used for the same purpose by the Canelos in Ecuador (8, p. 312).

12. **Strychnos Smithiana** Krukoff, Brittonia 4:287. 1942.

The species doubtless occurs in Amazonian Colombia. The type collection (*Krukoff 8680*) was obtained in Brazil in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

13. **Strychnos Erichsonii** Rich. Schomb. Reisen 3:1082, hyponym. 1848; Mart. Fl. Bras. 6 (1):274. 1868.

The species doubtless occurs in Amazonian Colombia. Several collections were obtained by the senior author in Brazil, in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

The bark of this species is reported to be used as an aphrodisiac in British and Dutch Guianas.

14. **Strychnos Mitscherlichii** Rich. Schomb. Reisen 2:451. 1848.

Colombia: Valle del Cauca: *Cuatrecasas 15811* (NY); *16617* (NY); *17310* (NY).

Cuatrecasas 17310 was collected at "Costa del Pacífico Río Cajambre, San Isidro, 5-100 met. alt."; *Cuatrecasas 15811* at "Costa del Pacífico, Río Yurumangui, Veneral, bosques, 5-50 met. alt.", and *Cuatrecasas 16617* at "Río Calima (región del Chocó), La Trojita, 5-50 met. alt.".

Ducke and Froes note on the labels of specimens collected in the basin of Río Tonantins that the plant is used in Curare by the Cauichana Indians. It is occasionally used as a secondary ingredient in the Curare by the Canelos of Ecuador (8, p. 313).

15. **Strychnos darienensis** Seem. Bot. Voy. Herald. 166. 1864.

Colombia: Valle del Cauca: *Cuatrecasas 17673* (NY).

This specimen has been collected at "Costa del Pacífico, Río Cajambre, selva, 5-80 met. alt."

"Said to be worthless as arrow-poison component" (*A. C. Smith 2837*, from British Guiana).

16. **Strychnos guianensis** (Aubl.) Mart. Syst. Mat. Med. Bras. 121. 1843.

Colombia: Vaupés: basin of Río Vaupés, *Cuatrecasas 6921* (US, COL).

Schreiber (Naturforscher 19:146.1783) reported the species, under the name *Toxicaria americana,* as one of the components of the Curare of certain tribes of Indians in Surinam. This has been confirmed, and the specimens cited in our previous paper on *Strychnos* (4, p. 297) from this colony were reported by the collectors, Dr. Stahel and Dr. Geyskes, as the main component of the Curare of the Indians of the upper Litanie. The species apparently is also the principal ingredient in the Curare of tribes of Indians in the adjacent French and British Guianas. The type of *S. Crevauxiana* (which is placed in synonymy under *S. guianensis* by us) from the upper Paru, southern French Guiana, was reported by Crevaux as the main ingredient of Curare of the Trios (1, p. 377) and of the Roucouyennes (9, p. 197), whereas *A. C. Smith 2836* from the basin of Shodikar Creek (Essequibo tributary) in British Guiana is stated to be the most important component of Wai-wai Balauitú (arrow poison). It is noteworthy that the Wai-wais, like the Trios, use chiefly the outer bark of roots. According to Gill, the plant is occasionally used as a secondary ingredient in the Curare by the Canelos in Ecuador (8, p. 311). Humboldt and Bonpland (3) mentioned "Curare" or "Bejuco de Mavacure" as one of the plant furnishing the ingredients of the poison as prepared by Indians at Esmeralda on the upper Orinoco in Venezuela. This plant is the basis of *S. Curare*, a doubtful species which may well be a synonym of *S. guianensis*.

17. **Strychnos panurensis** Sprague and Sandw. Kew Bull. 1927:132. 1927.
Colombia: Vaupés: basin of Río Vaupés, *Cuatrecasas 7033* (US, COL); *7033a* (US, COL); Chocó: *Cuatrecasas 16918* (NY).

18. **Strychnos cogens** Benth. Jour. Bot. Hook. 3:241. 1841.

The species doubtless occurs in Amazonian Colombia. *Krukoff 9086* was collected in Brazil in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

According to the Schomburgk brothers the species provides, under the name "Arimaru", an ingredient of the Curare of the Macusi Indians in British Guiana.

19. **Strychnos parviflora** Spruce; Benth. Jour. Linn. Soc. 1:107. 1856.

The species doubtless occurs in Amazonian Colombia. Several collections were obtained by Krukoff in Brazil in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

20. **Strychnos Castelnaeana** Wedd. in Castelnau, Exped. Am. Sud. 5:22. 1851.

The species doubtless occurs in Amazonian Colombia. Several collections were obtained by Krukoff in Brazil in a locality drained by Igarapé Belem at a distance of approximately 20 kilometers from the Colombian border.

This species is well known as the main ingredient of Curare of Indian tribes inhabiting the basin of the upper Solimoes (and its tributaries), that is, the region now centering around the border common to Perú, Brazil and Colombia. The type collection represents the main ingredient of the Curare as prepared by the Orejones on "River of Poison" in Perú and was obtained by Castelnau in 1846. Baillon (1, p. 375) gives interesting information concerning the distribution of the plant and its usage in Curare (this data, based on the field work of Jobert and Crevaux, has been recently confirmed for the greater part by the senior author on his trip to the upper Solimoes): "Nous devons à cet égard des renseignements exacts et circonstanciés à M. Crevaux, qui a visité cette année les tribus des Pebas et des Ticunas, et qui a trouvé le *S. Castelnaeana* depuis Teffé et Calderon sur l'Amazone, du côté du sud-est, jusqu'à une faible distance, au nord, de la rive droite du río Negro, et dans la Colombie à l'ouest, jusqu'à une centaine de lieues à l'est de la chaîne des Andes. Nous savons par le même explorateur que dans le Solimoens, le Javari, l'Ica et le Yapura, c'est toujours cette même espèce dont l'écorce sert à préparer le poison, et c'est bien aussi la même plante qu'à Calderón M. Jobert a employée sur place pour l'extraction du Curare." It is of interest to note that in the first physiological experiments conducted by La Condamine in Leiden in 1745 the material used was the Curare of the Tecunas of Brazil brought back by La Condamine from his trip across the South American continent, and therefore likely prepared of the bark of *S. Castelnaeana* as a main ingredient.

21. **Strychnos brachistantha** Standley, Field Mus. Publ. Bot. 12:412. 1936.
Colombia: Bolívar: *Curran 73* (NY), *418* (NY).

22. **Strychnos nigricans** Prog. in Mart. Fl. Bras. 6 (1):280. 1868.

The species doubtless occurs in Amazonian Colombia. It has been collected in Amazonian Perú and Brazil; in the latter country—not far from the Colombian border.

23. **Strychnos Poeppigii** Prog. in Mart. Fl. Bras. 6(1):282. 1868.

This species probably occurs in Amazonian Colombia. It has been collected in Amazonian Perú and Brazil.

24. **Strychnos longisepala** Krukoff, Brittonia 4:317. 1942.

The species doubtless occurs in Amazonian Colombia. It has been collected in Amazonian Perú and Brazil; in the latter country—not far from the Colombian border.

25. **Strychnos tarapotensis** Sprague & Sandw. Kew Bull. 1927:131. 1927.

Colombia: Cundinamarca: between Tocaima and Pubenza: ?*Killip, Dugand & Jaramillo 38309* (US, COL).

This specimen is sterile and we are unable to identify it with any certainty.

LITERATURE CITED

1. Baillon, H.—Nouvelles observations sur les plantes du curare. Adansonia 12: 366-381. 1879.
2. Ducke, A.—O gênero Strychnos L. na Amazonia Brasileira. Boletim Técnico do Instituto Agronômico do Norte No. 3. 1945: 1-23. 1945.
3. Humboldt, A. von & Bonpland, A.—Voyage aux régions équinoxiales du Nouveau Continent (Relation historique du voyage) 2: 547-556. 1807.
4. Krukoff, B. A. & Monachino, J.—The American species of Strychnos. Brittonia 4: 248-322. 1942.
5. Krukoff, B. A. & Monachino, J.—Supplementary notes on the American species of Strychnos.—1. Brittonia 5: 21-24. 1943.
6. Krukoff, B. A. & Monachino, J.—Supplementary notes on the American species of Strychnos—2. Manuscript in preparation.
7. Krukoff, B. A. & Smith, A. C.—Notes on the botanical components of Curare. Bull. Torrey Club 64: 401-409. 1937.
8. Krukoff, B. A. & Smith, A. C.—Notes on the botanical components of Curare II. Bull. Torrey Club 66: 305-314. 1939.
9. Planchon, G.—Etudes sur les Strychnos. Jour. Pharm. V. 1: 18-24, 193-198, 293-300, 380-384, 488-493. 1880.